

**THE BIRD POPULATION IN SELECTED AREAS OF THE GORGE**

**by**

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## INTRODUCTION

The Gorge was selected to obtain information on the ecology of the birds of a hemlock forest. The head of the Gorge is one of the few areas in the near vicinity with a concentration of mature hemlock. The area was then enlarged to include a small stand of cedar-and balsam for the comparison of coniferous conditions. The intervening remains of a beaver pond were included to record edge birds and to make a record that can be compared with later successional stages.

The Gorge is located in Sec. 53, Munro Twp. (T. 57 N., R. 3 W.), Cheboygan County, Michigan, in the University of Michigan Biological Station Forest. The field work was done on thirteen days from June 28, 1946, to August 7, 1946. A trail was made through the area and plotted on a map. I did not follow the trail but used the markers to plot the birds. In the cedar-balsam area the trail was along the east side; I would walk westward from a marker to Carp Creek and return at a slight angle to come out near the next marker. I interpolated my results from this location and repeated the procedure. Birds were plotted on these maps for seven days of field observations, all in July. Records for any one species were compiled and territories were plotted. The populations were determined from the numbers of territories.

The study was conducted under the direction of Dr. S. Charles Kendeigh to whom acknowledgement is made. I also wish to acknowledge the reciprocal aid of James D. Watson in measuring trails and counting trees.

# The Gorge

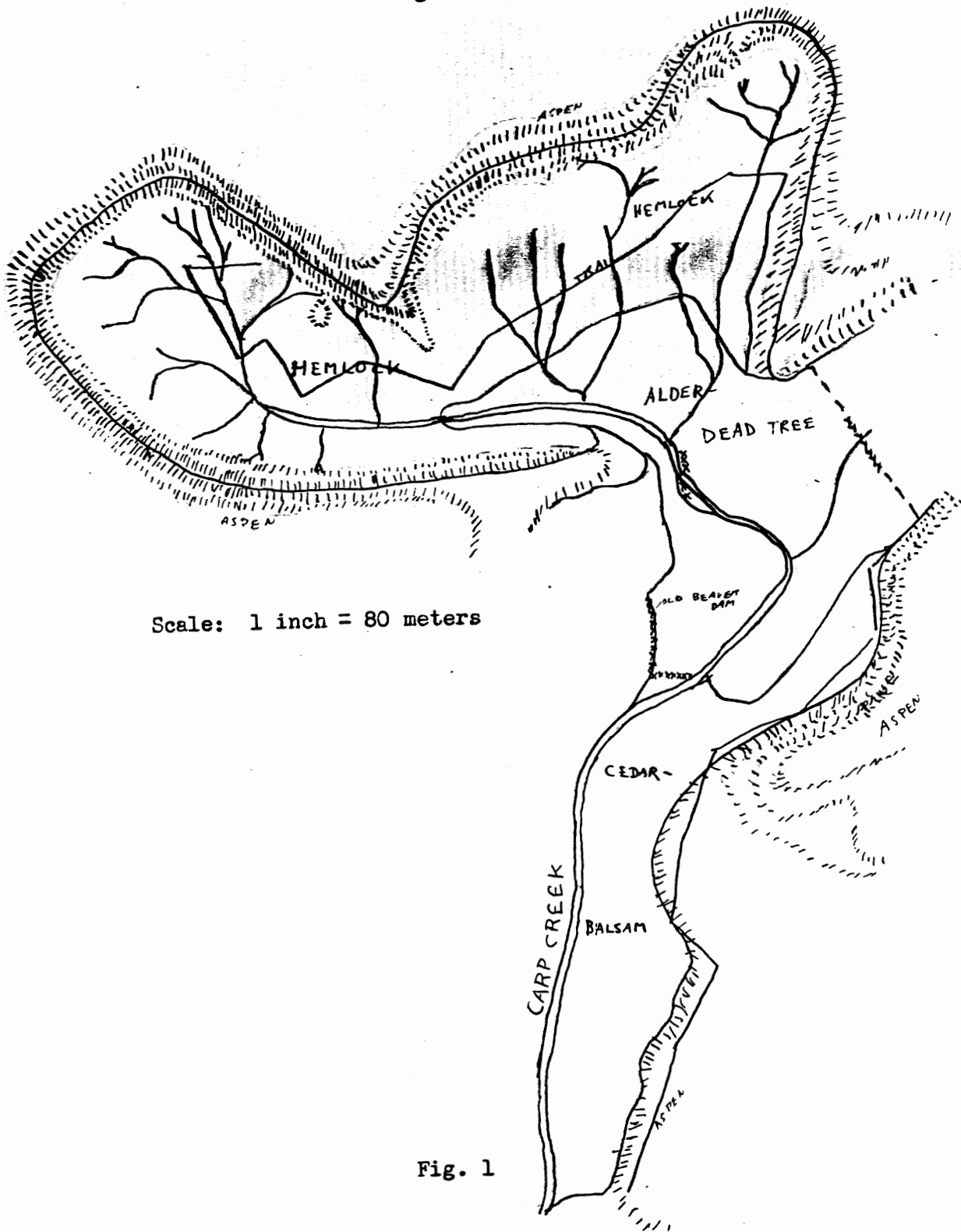


Fig. 1

### HABITAT

The surface outlet of Douglas Lake is Maple River which drains into Burt Lake by a rather devious route. In this flow there is a drop of over 1100 feet (more than the depth of Douglas Lake). Since the soil is predominantly sandy, much of the drainage goes by a more direct route, by seepage from the so-called Big Springs in the heads of the Gorge. These springs form streamlets which join to form Carp Creek which flows southward for about one mile through Reese's Bog and emptying into Burt Lake. The sapping action has formed the Gorge and presumably will sometime move back into Douglas Lake and eventually draining it (Scott 1921). The valley of the Gorge (about 70 feet deep) begins to widen south of the springs at the head becoming wider just north of the Hogback Road by additional springs and becoming merely a stream bed towards its mouth. The stream at its source is fairly swift, clear, and cool, (Gates and Wollett 1926).

The soil types are shown on the soil survey map for Cheboygan County (Foster, et al, 1939). The upland territory surrounding the Gorge and the Big Springs area in the Gorge are shown as Roseland Sand. This is only covered by a thin accumulation of forest litter, and originally supported a forest cover of red pine, white pine, and some oak which has mostly been removed with a new forest cover of aspen, oak, red maple, and other trees with remnant seed pines and their progeny. This is probably a quite reasonable description of conditions of the area on the upper rim of the Gorge, but conditions around the springs are quite different. The backward moving springs have eroded the sand in its course (it does not hit bed rock). It is reasonable to assume that a certain amount of the surface layers of soil have moved down into the valley causing a mixing of the soil. This upland soil is quite dry but with the conditions of active springs and mixture of soils there will be different type of vegetation with a rapid

growth rate. This has caused an increase in the amount of organic material in the soil which has resulted in a soil type different from that shown on the above mentioned maps and a corresponding difference in the vegetation.

The soil of most of the alder-dead tree area and the cedar-balsam area is shown as Greenwood Peat. This type is a mat of spongy, coarse, fibrous organic matter, often on wet sandy flats. In this area the runoff is mostly by seepage rather than by a system of streamlets as was found in the hemlock area.

The area studied can be divided according to three vegetation types. The upper area containing most of the springs is predominantly hemlock forest. The area immediately below this is the result of flooding due to beaver and consists of dead trees and the recent alder. An area of cedar and balsam occurs just downstream. The area studied consists of the whole hemlock area (12.6 acres), the central portion of the old beaver pond (5.2 acres), and the adjacent cedar-balsam area on the east side of the stream (4.2 acres).

The Gorge suffered from the depredation of severe lumbering and subsequent fires in the last century. Since reforestation is reasonably rapid in wet areas, the Gorge is now well supplied with good sized trees. In the middle 1930's the beaver which had for 10 years lived on the lower course of Carp Creek began to move upstream and build dams which caused flooding leading to the death of many trees. To prevent further destruction of the Gorge as a scenic spot the beaver were destroyed. The drainage of the pond has allowed a new plant community to arise.

The hemlock area consists of 12.6 acres of tall trees, predominantly hemlock (Tsuga canadensis) with various amounts of beech (Fagus grandifolia), yellow birch (Betula lutea), sugar and red maple (Acer saccharum and A. rubrum), and white cedar (Thuja occidentalis). The larger trees, those which formed the canopy of the forest (35 or 40 feet high up to 80 feet),



are almost exclusively hemlock, are rather uniform in size, about 10 inches in diameter which would be from 40 to 70 years old (estimate from ring counts on old stumps). The larger deciduous trees tend to be grouped in favorable areas among the hemlock. Ground vegetation was scattered and consisted mostly of seedlings and a few shrubs; dead needles and deciduous leaves cover the forest floor. There is an edge on the slope with the upland aspen community. Here the large aspen replace smaller hemlocks, and ground cover becomes denser; here are a few scattered red and white pine (Pinus resinosa and P. Strobus) and some red oak (Quercus rubra).

The alder-dead tree area has developed from draining the beaver the beaver pond after the beaver, were removed. The area is now covered by thick growth of grasses and herbaceous plants; the most important woody plant is the alder (Ulnus incana) which occurs in dense thickets over much of the area especially on the slightly higher soil.

The 4.2 acres of the cedar-balsam area are fairly uniform in physiognomy. The principle trees are white cedar and balsam fir (Abies balsamea) with some spruce (Picea) and scattered birches (Betula), Black ash (Fraxinus nigra), and alder. The trees are of all sizes forming a dense habitat that makes very difficult walking. Leaved branches range from near the ground to 50 or 60 feet high. The character of the forest is therefore quite different from that of the hemlock forest. The density of branches in the cedar-balsam type is much greater since the range of branches is greater while the shortness of the individual branches is more than made up by the number of trees. Although the branches are horizontal from the main trunk (which tends to separate the trees), these branches are long and the density of the leaves is greatest at the tips (also the number of crotches). Ground plants are in general too scarce to be important. There are three openings in the forest of about a tenth of an acre apiece where grasses, and if wet, sedges, and occasionally <sup>shrubs</sup> grow.

POPULATION

The breeding bird population of the Gorge is shown in the following table. The number of pairs is the number whose territories were at least partially within the area. Under edge the abbreviation a stands for territories only partly included in the area with the remainder in similar habitat and ha for territories only partly included in the area with the remainder in a different habitat. The density is the number of pairs per 100 acres calculated from the number of territories and parts of territories. The territories are shown in figures 2 through 9. The population of each area is discussed following the annotated list.

Table 3. Bird populations in selected areas of the Gorge.

Species	Hemlock			Alder-dead tree			Cedar-balsam		
	Pairs	Edge	Density	Pairs	Edge	Density	Pairs	Edge	Density
Woodcock				1	a	13.9			
Flicker				1	ha	9.3	1	ha	11.9
Crested Flyca'r				1		18.5			
Wood Pewee	1	ha	3.9						
Blue Jay	1	ha	2.0	1	a	9.3	1	ha	5.9
Chickadee	1		7.8				2 <sub>m</sub>	a&ha	23.8
Robin	1	ha	5.9				1	a	17.6
Hermit Thrush	1	ha	2.0						
Cedar Waxwing				1		18.5			
Red-eyed Vireo	3	ha	11.7						
Black & White W.	2	ha	3.9	2	ha	27.8			
Nashville Warbler							1		23.8
Blk-tht Green W.	2		15.7						
Ovenbird	4	ha	15.7				1	ha	11.9
Yellow-throat				2		37.0			
Purple Finch							1		23.8
Song Sparrow				2		37.0			
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	16		68.6	11		171.3	8		118.9



Territories of Birds in the Hemlock Area

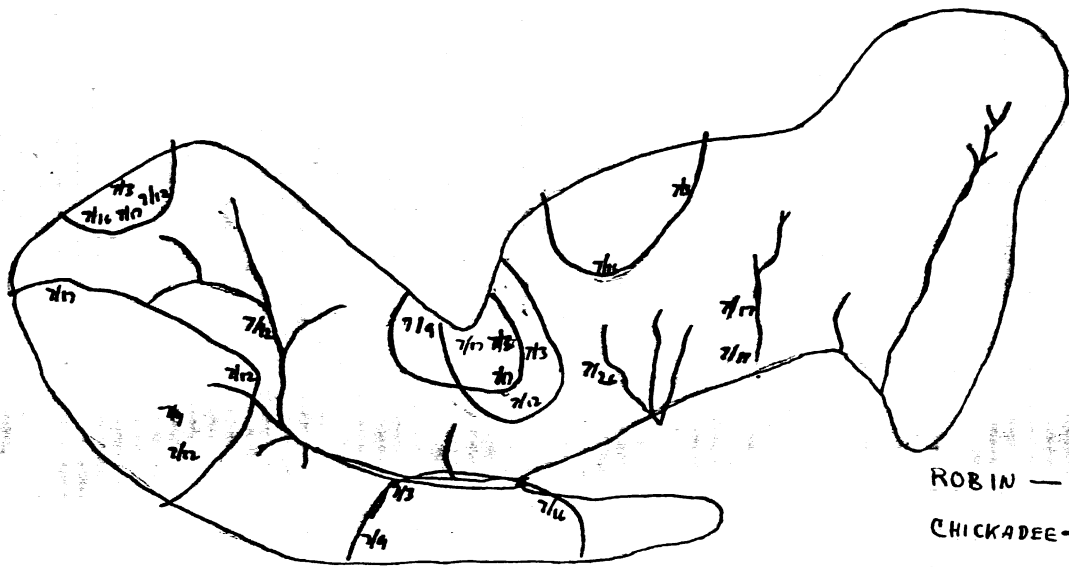


Fig. 2

- ROBIN —
- CHICKADEE —
- WOOD PEWEE —
- OWEN BIRD —

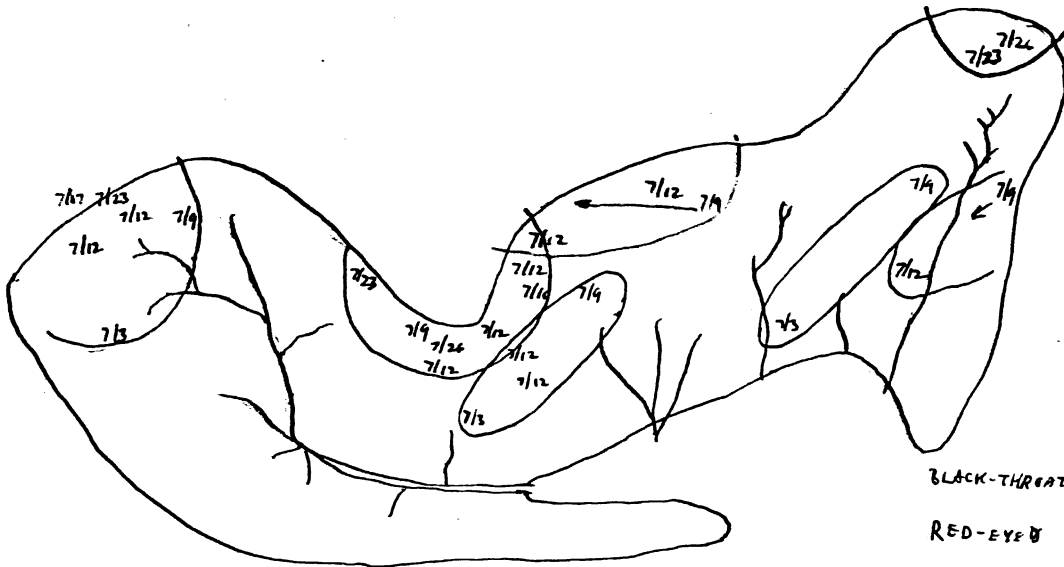
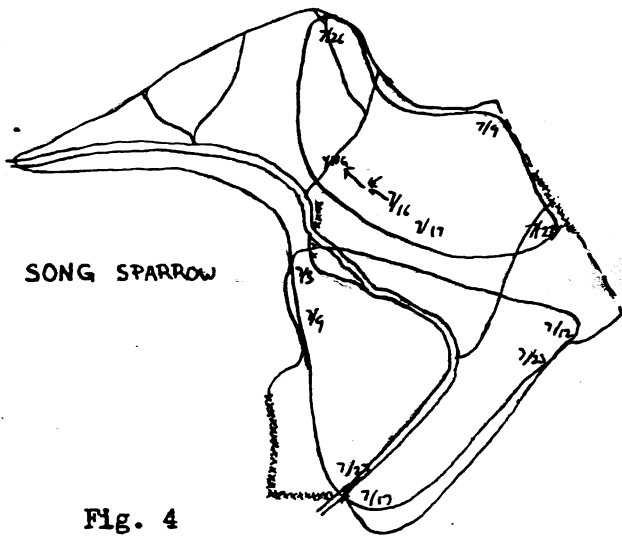


Fig. 3

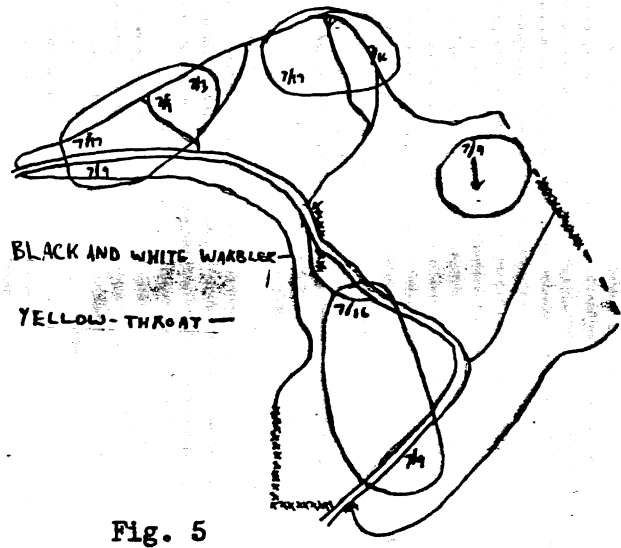
- BLACK-THROATED GREEN WARBLER —
- RED-EYED VIREO —
- HERMIT THRUSH —
- BLUE JAY —

Territories of Birds in the Alder-Dead Tree Area



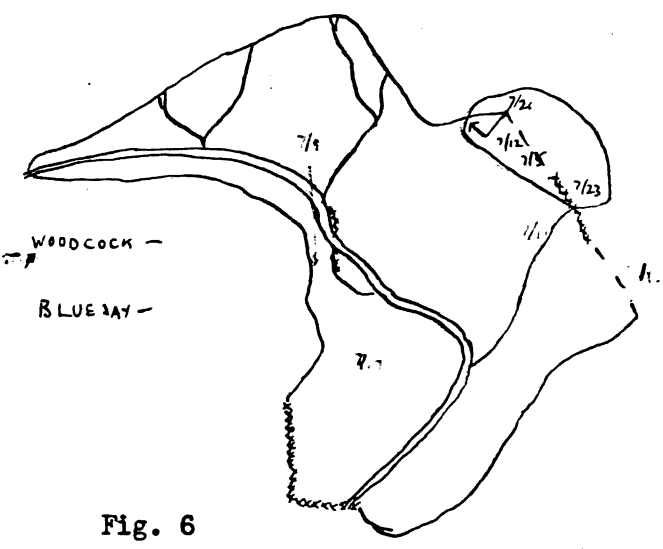
SONG SPARROW

Fig. 4



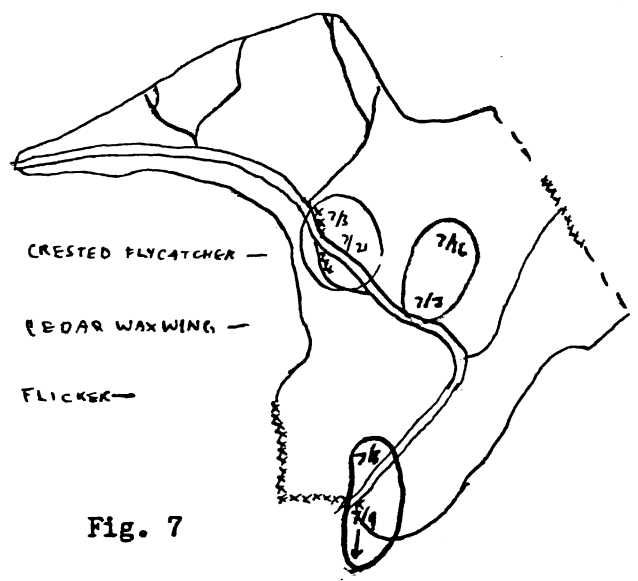
BLACK AND WHITE WARBLER  
YELLOW-THROAT

Fig. 5



WOODCOCK  
BLUE JAY

Fig. 6



CRESTED FLYCATCHER  
CEDAR WAXWING  
FLICKER

Fig. 7



ANNOTATED LIST

The following eighteen species were regarded as regular breeding birds.

A Woodcock pair used the alder-dead tree area; one bird or the pair was always flushed from wet soil among dense alder growth.

The Flickers listed under the alder-dead tree and cedar-balsam areas were one pair whose territory was on the edge of the two areas.

The Crested Flycatchers nested in a dead tree stub, about 20 feet above the water (found July 5). The requirements for this pair was an elevated cavity for a nest site which was provided in this area without the benefit of living trees.

A Wood Pewee sang regularly from the hemlock aspen edge.

The Blue Jay is too wide ranging to accurately determine its population on a limited area late in the season; it was not found in the denser evergreen.

The number of pairs of Black-capped Chickadee are only approximations since post-nesting movement had probably begun by early July.

The Robin occurred in the two wooded habitats.

A singing Hermit Thrush was heard from the hemlock aspen edge on the slope in the ravine at the northeast end of the Hemlock area; the territory could not be accurately mapped since the bird was heard at a distance but from both directions.

One pair of Cedar Waxwings used the alder-dead tree area; they possibly nested in some of the tall alder or some of the living trees near the edge.

The Red-eyed Vireo occurred only along the hemlock aspen edge.

Two pairs of Black and White Warblers had territory along the

hemlock alder-dead tree edge.

The two pairs of Black-throated Green Warblers occurred entirely within the hemlock area.

The Ovenbirds occurred along the hemlock-aspen edge and the cedar-balsam-aspen edge.

The Yellow-throats occurred among lowland grasses and sedges in the alder-dead tree area.

The Cowbird was found at various times in all three areas.

The Purple Finch territory was entirely within the cedar-balsam area.

The Song Sparrows were found in the aspen-dead tree area and in an opening just south of the study areas.

Additional species used or flew over the area.

The Great Blue Heron is a post-nesting visitant (one record).

One Sharp-shinned Hawk was seen being chased over the area by a Kingbird.

The Solitary Sandpiper is a post-nesting migrant visitant (one record).

The Nighthawk was seen feeding or flying over the area almost daily; one was seen perched on a dead tree in the alder-dead tree area.

The Ruby-throated Hummingbird is a post-nesting visitant (one record).

The Hairy Woodpecker was seen only on preliminary surveys; suspected of having nested in the alder-dead tree area.

A Kingbird was seen chasing a Sharp-shinned Hawk over the area.

A Phoebe was once recorded in the alder-dead tree area.

An adult Least Flycatcher was seen with food in an aspen just above the hemlock area on June 28; it was not seen again.

A Purple Martin was once seen flying over the area.

A Winter Wren had a territory immediately downstream from the study area, but it was found in the hemlock-alder-dead tree edge twice after the nesting season.

A Golden-crowned Kinglet was heard singing at the very south end of the Cedar-balsam area on July 2; it was not recorded again.

A male Myrtle Warbler was singing at the very southeast end of the cedar-balsam area on July 9; it was not recorded again.

Many Goldfinches flew over and fed especially in the alder-dead tree area, but there was no evidence of nesting here.

Red-eyed Towhees songs were heard from a distance on two days; the voices were thought to originate at widely separated spots on the hemlock-alder-dead tree edge.

#### DISCUSSION

The total population of the alder-dead tree area is of interest in comparison with future studies following succession in the plant community. The population of the cedar-balsam area is useful in comparison with that of the hemlock area, both under Gorge conditions (see below), but with an area of only 5.2 acres it can not be compared with a large cedar-balsam area such as Reese's Bog.

The population of the 12.6 acres of hemlock was the interesting feature. It seems almost impossible that such an area would only have a population density of 68.6 pairs per 100 acres. An explanation is desirable. One possible factor is the coverage. All counts were made during July which would tend to lower the total. The method of plotting had a limit to its accuracy. These factors alone do not explain the results nor do they explain the lack of song in the area even in the early morning.

The explanation must be due to some conditions or conditions of the habitat; apparently many avian niche requirements are not satisfied. Gorge conditions result in a decreased visibility laterally, available running water, lower temperatures (largely a result of the running water and much shade), a shorter period of daylight and a longer period of twilight, and a difference in the vegetation which is the result of these and other physical factors. Hickey (1943, p. 192) lists five breeding bird censuses from 'Canyons, Creek Bottoms, Etc.) four of which range from 26.8 to 45 adults per 10 acres (134-225 pairs/100 acres). The other census had a population of 10.6 adults per 10 acres (53 pairs  $\frac{1}{2}$  100 acres) and was of a New Mexico canyon, 90 acres of 'aspens, virgin conifers, oaks; at elevation of 8000 feet'. The stated conditions might explain the results for this last census but the results of the other censuses would indicate that gorge conditions are not unfavorable for birds.

The remaining important consideration is that of vegetation. This was described earlier and a discussion of the comparative physiognomy of the hemlock and cedar-balsam communities was included. Lack of undergrowth and lack of volume of arboreal habitat would tend to lower the density of birds. The characteristics of the hemlock trees are the major factors in the density of the birds in the area. In the region of northern lower Michigan, the hemlock is generally known as a member of a beech-maple climax forest, its abundance varying with the amount of moisture (within limits; in lowland areas it is often on the somewhat drier soil). In concentrations of hemlock where the increase of organic material will eventually bring in the deciduous species to lower the abundance of hemlock. Under special conditions the area will not change, as in the Gorge due to the continuous supply of water by the springs.

The physiognomy of a forest is a primary factor controlling the abundance of birds. The physiognomy of a forest is determined by its parts, their structure and density (absolute and relative). The parts of a forest are the plants - trees, shrubs, and herbaceous growth. The trees are the most important parts and with which this discussion is primarily concerned. The physical characteristics of a tree are those of the species, varying with age and environment. Type of leaves and form of branching are species characteristics rather unaffected by age. On the other hand, height, actual volume, effective volume (concerning birds), amount of forest floor space consumed, number of branches and leaves, and similar characteristics are principally determined by the age of the tree. In general these dimensional characteristics increase with age, but each at a different rate. The species differ in the relative rates for two factors <sup>for one species</sup> as compared to the relative rates for the same two factors of another species. A simple example might be the relation of the rate of growth in width and height in a cedar or balsam as compared to the relation in hemlock. Since all factors are operating at once, the result is a complex of differences.

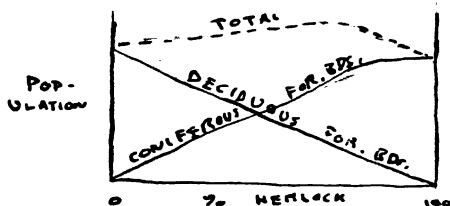
With the material of the above paragraph in mind, we can compare our cedar-balsam forest with our hemlock forest. The cedar and balsam trees are somewhat similar in their growth form, but there is a definite difference in their leaf form (this could involve a discussion of its own and will not be treated here). Both of these trees tend to grow tall and slim, the growth rate laterally is quite slow compared to the growth rate in a vertical direction. In the hemlock the growth laterally compared to the increase in height is larger than in the other two species (so fewer hemlocks per unit area. The hemlocks also tend to lose the lower branches with an increase in height decreasing the proportion of branched trunk to the total height.



These factors influence the amount of space on the forest floor consumed by the tree and the actual and effective volume of the tree. Here the factor of density and occurrence of leaved branches is important. In the hemlock, compared to the cedar or balsam, this volume is decreased by the spacing of the branches and increased by the length of the leaved portion of the branches. In a unit area of forest the effective volume of large hemlock trees is smaller than the effective volume in similarly sized cedar or balsam.

As a member of the beech-maple climax forest, the hemlock provides niches for birds that would not occur in a pure deciduous forest. If the percentage of hemlock in a forest is increased, there will be an increase in the number of coniferous forest birds particularly those that need not feed in coniferous trees. When there are enough trees so that nest sites can be provided for the maximum number of pairs spaced by the territorial system the total numbers of pairs will begin to diminish due to the further loss of deciduous forest birds, reaching a minimum when the stand is nearly pure large hemlock.

Fig. 10



BIRDS AND THE COMPOSITION OF THE FOREST

The lack of ground cover, the purity and size of the stand of hemlock (with its characteristic physiognomy), and the possibility of a low in the year to year variation are the factors accounting for the low density in this hemlock forest.

### SUMMARY

Areas of the Gorge were selected for an ecological study of the bird population.

Factors and history of physical conditions in the Gorge are given. The area studied is divided into three parts: a hemlock area, an alder-dead-tree area, and a cedar-balsam area.

The population of each area is presented on a table (#5).

A list of the birds is given with additional relevant data.

The density of the population in the hemlock area is analyzed and an hypothesis based on the physiognomy of the forest is presented.

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